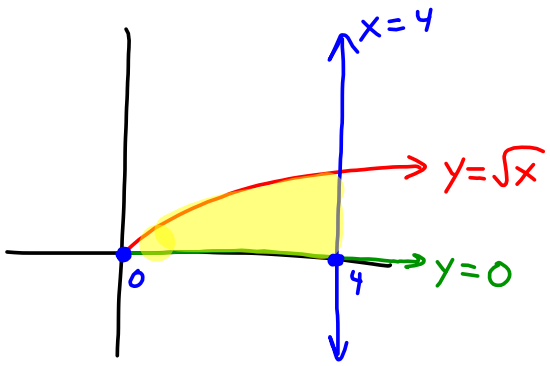
5/16/18 "There is no traffic on the extra mile"-Anonymous

HW: "2017 Calc L34 Volume HW" #1-2

Test 2 on Wednesday 5/23

AIM: How do we find Volume?

1. Find the area of the region bounded by $y=\sqrt{x}$ $y=0$ *and* $x=4$



$$\text{Area} = \int_a^b (\text{Top} - \text{Bottom})\, dx$$

$$A = \int_0^4 (\sqrt{x} - 0)\, dx$$

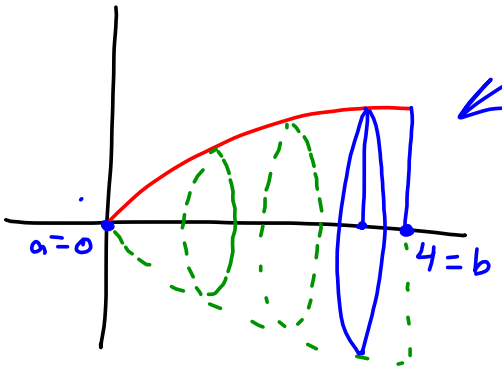
$$A = \int_0^4 (x^{1/2})\, dx$$

$$A = \frac{2}{3}x^{\frac{3}{2}} + c \Big]_0^4$$

$$A = \frac{2}{3}(4)^{3/2} - \frac{2}{3}(0)^{3/2}$$

$$= \boxed{\frac{16}{3} \text{ units}^2}$$

2. If we rotated the area from example #1 about the x-axis, what would the volume of the resulting solid be?



each cross section "slice" is a circle.

Area of each circle $= \pi r^2$

In this situation

Area of each circle $= \pi(\sqrt{x})^2$

$$V = \int_a^b \text{cross sectional area}$$

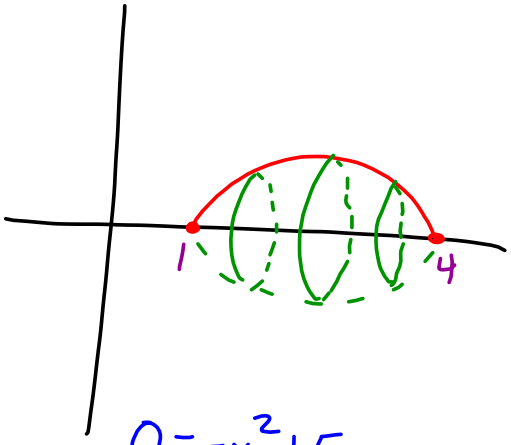
$$V = \int_0^4 \pi(\sqrt{x})^2 \, dx = \pi \int_0^4 (\sqrt{x})^2 \, dx$$

$$V = \pi \int_0^4 x \, dx$$

$$V = \pi (8)$$

$$V = \boxed{8\pi \text{ units}^3}$$

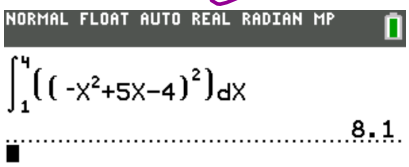
3. Given $f(x) = -x^2 + 5x - 4$ Let "R" be the region in the 1st quadrant between *f(x)* and the x-axis. What is the volume of the solid formed by rotating "R" about the x-axis?



$$V = \pi \int_a^b (f(x))^2 \, dx$$

$$V = \pi \int_1^4 (-x^2+5x-4)^2 \, dx$$

$$V = \pi$$



$0 = -x^2 + 5x - 4$

$0 = x^2 - 5x + 4$

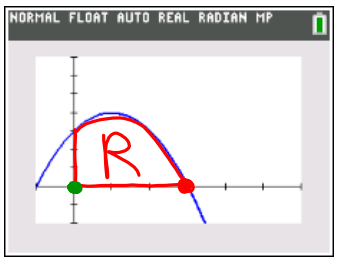
$(x-4)(x-1)$

$x = 4 \quad x = 1$

$V = 8.1\pi$ units^3

4. Let "R" be the region in Q1 bounded by $y = 3 + 2x - x^2$, $y = 0$, *and* $x = 0$
   a. Find the area of "R"
   b. Find the perimeter of "R"
   c. Find the volume of the solid generated by rotating "R" about the x-axis

a)



$3+2x-x^2=0$

$x^2-2x-3=0$

$(x-3)(x+1)=0$

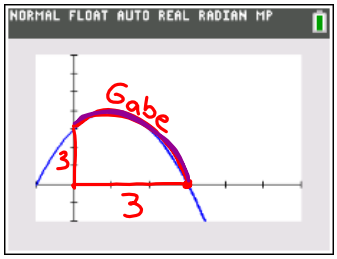
$x=3 \quad x=-1$

Q1

$$\text{Area of } R = \int_0^3 \left(3+2x-x^2-(0)\right)dx$$

$$\text{Area} = \boxed{9 \text{ units}^2}$$

b)



$$\text{length of Gabe} = \int_0^3 \sqrt{1+(2-2x)^2}\,dx$$

Gabe = 6.126 units

$f(x) = 3+2x-x^2$

$f'(x) = 2-2x$

Perimeter = $3+3+6.126$

$= \boxed{12.126 \text{ units}}$

c) $$\text{Volume} = \pi \int_0^3 \left(3+2x-x^2\right)^2 dx$$

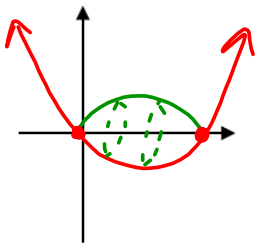
$$\boxed{\text{Volume} = 30.6\pi \text{ units}^3}$$

HW Check

1. $y = x^2 - 4x$; $y = 0$ about the x-axis

$V = \int_a^b \pi (f(x))^2 \, dx$

$V = \pi \int_a^b (f(x))^2 \, dx$



$x^2 - 4x = 0$

$x(x-4) = 0$

$x = 0 \quad | \quad x = 4$

$a \qquad b$

$V = \pi \int_0^4 (x^2 - 4x)^2 \, dx$

$V = \frac{512}{15}\pi$ units^3

2. $y = x^3$ $x = -2$ $y = 0$ about the x-axis

$x^3 = 0$

$x = 0$

$V = \pi \int_{-2}^{0} (x^3)^2 \, dx$

$V = \frac{128}{7}\pi$ units^3